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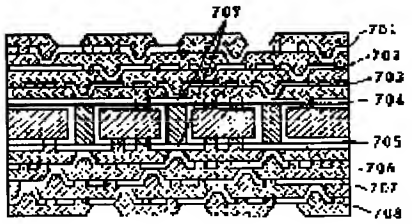
(54) MULTILAYER WIRING SUBSTRATE, MANUFACTURE THEREOF, AND MANUFACTURE OF DOUBLE SIDE PRINTED WIRING BOARD

(57)Abstract:
PURPOSE: To obtain a highly reliable and high density wiring board having excellent heat-resisting property, mechanical characteristics and electric charactistics and the like at low cost by a method wherein a conductor pattern layer and an interlayer insulating film layer are alternately formed on the double-side printed wiring board, on which a conductor pad is provided, connected to the conductor of a filled-up through hole.
CONSTITUTION: At least one or more layers of conductor pattern layers 701 to 708 and an interlayer insulating film layer are alternately formed on a double- side printed wiring board where a conductor pad 709, to be connected to the conductor of a filled-up interlayer connection through hole is provided. The conductor pad 709, the conductor pattern layers 701 to 708 are electrically connected with one another. For example, after the through type plated through hole of the double side printed wiring, where the surface layer conductor is patterned, and the conductor gap have been filled up by an organic high molecular insulating film, a conductor pad 709, which will be connected to the surface conductor and the through type plated through hole conductor, is formed.



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CLAIMS

[Claim(s)]
[Claim 1] The multilayer-interconnection substrate which the conductor pattern layer and layer insulation membrane layer of at least one or more layers are formed by turns on the double-sided printed wiring board with which the contact pads linked to the conductor of the interlayer connection through hole made up for were prepared, and these contact pads, a conductor pattern layer, and conductor pattern layers are connected electrically, and changes.
[Claim 2] (1) a penetration plating through hole -- having -- a surface -- said penetration plating through hole of the double-sided printed wiring board with which patterning of the conductor was carried out, and said conductor -- the process which fills up a gap with the insulator layer of an organic system macromolecule, and the surface of a (2) this double-sided printed wiring board -- a conductor and a penetration plating through hole -- the manufacture approach of a double-sided printed wiring board that the contact pads connected to the conductor and said conductor of the interlayer-connection through hole including the process which forms the contact pads linked to the predetermined location of a conductor made up for were prepared.
[Claim 3] (1) a penetration plating through hole -- having -- a surface -- the process into which a conductor fills up with the insulator layer of an organic system macromolecule said penetration plating through hole of the double-sided printed wiring board by which patterning is not carried out, and (2) this double-sided printed wiring board surface -- a conductor and a penetration plating through hole -- the manufacture approach of a double-sided printed wiring board that the contact pads connected to the conductor and said conductor of the interlayer-connection through hole including the process which forms the contact pads linked to the predetermined location of a conductor made up for were prepared.
[Claim 4] a penetration plating through hole -- having -- a surface -- said penetration plating through hole of the double-sided printed wiring board with which patterning of the conductor was carried out, and said conductor -- the process which fills up a gap with the insulator layer of an organic system macromolecule (1) The process which sandwiches the fluid organic system macromolecule precursor which installs metal mold with a flat front face on this double-sided printed wiring board, and does not contain a solvent between this double-sided printed wiring board and this metal mold, (2) -- the process which exhausts between this metal mold and these double-sided printed wiring boards, and the fluid organic system macromolecule precursor which is made to move (3) this metal mold in this double-sided printed wiring board direction, and does not contain this solvent -- said penetration plating through hole and said conductor -- with the process with which a gap is filled up (4) The process which pours hydrostatic pressure on the fluid organic system macromolecule precursor which does not contain this solvent, (5) The process which hardens the fluid organic system macromolecule precursor which does not contain this solvent, (6) -- said conductor covered with this organic system macromolecule -- the manufacture approach of a double-sided printed wiring board that the contact pads connected to the conductor and said conductor of the interlayer connection through hole which is characterized by including the process at which a top face is exposed, and which was made up for were prepared.
[Claim 5] a penetration plating through hole -- having -- a surface -- the process into which a conductor fills up with the insulator layer of an organic system macromolecule said penetration plating through hole of the double-sided printed wiring board by which patterning is not carried out (1) The process which sandwiches the fluid organic system macromolecule precursor which installs metal mold with a flat front face on this double-sided printed wiring board, and does not contain a solvent between this double-sided printed wiring board and this metal mold, (2) -- the process which exhausts between this metal mold and these double-sided printed wiring boards, and the fluid organic system macromolecule precursor which is

made to move (3) this metal mold in this double-sided printed wiring board direction, and does not contain this solvent -- said penetration plating through hole and said conductor -- with the process with which a gap is filled up (4) The process which pours hydrostatic pressure on the fluid organic system macromolecule precursor which does not contain this solvent, (5) The process which hardens the fluid organic system macromolecule precursor which does not contain this solvent, (6) -- said conductor covered with this organic system macromolecule -- the manufacture approach of a double-sided printed wiring board that the contact pads connected to the conductor and said conductor of the interlayer connection through hole which is characterized by including the process at which a top face is exposed, and which was made up for were prepared.

[Claim 6] the surface of a double-sided printed wiring board -- a conductor and a penetration plating through hole -- the process which forms the contact pads linked to the predetermined location of a conductor (1) -- said penetration plating through hole or said penetration plating through hole, and said surface -- the whole surface surface of the double-sided printed wiring board with which the gap of a conductor was filled up with the insulator layer of an organic system macromolecule -- the object for pads -- with the process which forms a conductor (2) -- this -- a conductor -- with the process which forms the remnants pattern of a resist in the upper predetermined location (3) -- this -- the manufacture approach of a double-sided printed wiring board that the contact pads connected to the conductor and said conductor of the interlayer connection through hole which carries out patterning of the conductor to a predetermined configuration by etching, and is characterized by including the process which exfoliates this resist, and which was made up for were prepared.

[Claim 7] the surface of a double-sided printed wiring board -- a conductor and a penetration plating through hole -- the process which forms the contact pads linked to the predetermined location of a conductor (1) -- said penetration plating through hole or said penetration plating through hole, and said conductor -- the process at which a resist extracts in the predetermined location on the front face of a double-sided printed wiring board filled up with the insulator layer of an organic system giant molecule, and a gap forms a pattern in it -- (2) The manufacture approach of a double-sided printed wiring board that the contact pads connected to the conductor and said conductor of the interlayer connection through hole which is characterized by including the process which this resist extracts, forms a conductor in a pattern, and exfoliates this resist, and which was made up for were prepared.

[Claim 8] The process which forms (1) photosensitivity insulation resin on the printed wired board in which the contact pads connected to the conductor and said conductor of the interlayer connection through hole made up for were prepared, (2) The process which forms a beer hall in this photosensitive insulation resin by exposure and development, (3) -- the process which roughens this exposed photosensitive insulation resin front face, and (4) -- with the process which forms a conductor (5) -- the process which carries out full hardening of this photosensitive insulation resin according to heat curing, and (6) -- this -- the manufacture approach of the multilayer-interconnection substrate according to claim 1 which repeats the process which forms a pattern by etching of a conductor, and is characterized by multilayering.

[Claim 9] The manufacture approach of either double-sided printed wiring board of claim 4 and five publications that the fluid organic system macromolecule precursor which does not contain a solvent is characterized by being one containing at least one or more of a polyfunctional epoxy resin constituent, the constituent of the compound which has two or more maleimide frames in intramolecular, the constituent of the compound which has two or more cyanic-acid ester frames in intramolecular, and the constituents of the compound which has two or more benz-cyclo-butene frames in intramolecular of constituents.

[Claim 10] The manufacture approach of the multilayer-interconnection substrate according to claim 8 characterized by being either of the constituents with which photosensitive insulation resin contains the polyfunctional solid epoxy resin of two or more organic functions to which the addition reaction of the constituent or partial saturation radical which contains a solid polyfunctional unsaturated compound, an epoxy resin, an acrylate monomer, a photopolymerization initiator, and the heat-curing agent of an amine system in a room temperature was carried out at least, an acrylate monomer, a photopolymerization initiator, and the heat-curing agent of an amine system.

[Claim 11] The manufacture approach of a multilayer-interconnection substrate according to claim 10 that an amine system heat-curing agent is characterized by being either a dicyandiamide or a diamino triazine compound.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the high-density multilayer-interconnection substrate used for computers, such as a mainframe and a workstation, the exchange, etc. and its manufacture approach, and the manufacture approach of the double-sided printed wiring board used for said multilayer-interconnection substrate at a list.
[0002]
[Description of the Prior Art] In recent years, the high-density new multilayer-interconnection substrate replaced with a conventional multilayer-interconnection substrate and its conventional manufacture approach and its manufacture approach are proposed. For example, the build up method is mentioned. this approach -- fundamental -- a surface -- after a conductor forms a photosensitive insulating material on the surface of the printed wired board by which patterning was carried out, a beer hall is formed by exposure and development, and subsequently to the whole surface surface, after forming a conductor, patterning of the conductor is carried out. Furthermore, after repeating this and multilayering, it is the approach of forming a penetration plating through hole in the last.
[0003] this approach -- setting -- the surface of a printed wired board -- connection of the conductor layer of a conductor and a build up and the conductor layers of a build up is connected by not connection but the conformal beer by the penetration plating through hole by drilling. Therefore, a high-density multilayer-interconnection substrate is obtained compared with the printed wired board which takes an interlayer connection only in the conventional penetration plating through hole. however, the surface of a printed wired board -- a conductor and a inner layer -- since connection with a conductor and connection of printed wired board both sides are connection by the penetration plating through hole formed in the culmination of a production process, they have the fault to which a wiring consistency falls at this rate.
[0004] Moreover, on the printed wired board which forms by drilling and has the penetration plating through hole which is not made up for, since a photosensitive insulating material cannot be formed, the thin film multilayer-interconnection layer by the build up method cannot be formed. In addition, the technique given in JP,4-148590,A is known as a thing relevant to this.
[0005] As amelioration of said technique, resin restoration of the hole of the plating through hole formed by drilling for the interlayer connection is carried out, and there is the manufacture approach of a multilayer-interconnection substrate of forming the contact pads connected to a plating through hole and said conductor in the upper part, and using the area of a plating through hole effectively. The approach shown, for example in JP,4-168794,A is one of things relevant to this.
[0006] the penetration plating through hole too formed in connection of the two-layer conductor layer which separated both sides of a printed wired board or the conductor layer of one or more layers in the culmination of a production process although the above-mentioned approach is effective in connection of the two-layer conductor layer which a multilayer-interconnection substrate adjoins -- not depending -- it cannot obtain and the done multilayer-interconnection substrate has the fault that the penetration plating through hole which is not made up for remains.
[0007]
[Problem(s) to be Solved by the Invention] In the above-mentioned Prior art, when a penetration plating through hole was in the printed wired board of the base, the build up method had an inapplicable problem. the conductor layer formed with the build up even if it applied the build up method and formed the thin film multilayer-interconnection layer on the printed wired board of the base without a penetration plating through hole, and the inner layer of the printed wired board of **-SU -- a conductor -- in order to take

connection of a between, or connection of both sides of the printed wired board of **-SU, there is a problem that a penetration plating through hole must be formed in the culmination of a production process. Forming in the production process culmination of the above-mentioned penetration plating through hole had the problem that the penetration plating through hole which is not made up for remained, and it had the problem that the original function of the build up method which can form high density wiring was unutilizable for the maximum further.

[0008] It was made in order that this invention may solve the trouble of the above-mentioned conventional technique, and it excels in properties, such as thermal resistance, a mechanical characteristic, and an electrical property, and it aims at offering the manufacture approach of the double-sided printed wiring board used for the multilayer-interconnection substrate which has the high-density wiring function which is not about the effect of the hole of a penetration plating through hole where low cost and dependability are high, its manufacture approach of utilizing for the maximum the original high-density wiring function which the build up method can form, and said multilayer-interconnection substrate

[0009]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the conductor pattern layer and layer insulation membrane layer of at least one or more layers are formed by turns on the double-sided printed wiring board with which the contact pads connected to the conductor and said conductor of the interlayer connection through hole made up for were prepared, and these contact pads, said conductor pattern layer, and said conductor pattern layers connect electrically the configuration of the multilayer-interconnection substrate concerning this invention. Even if the above-mentioned double-sided printed wiring board contains the inner layer conductor layer, it does not interfere.

[0010] Moreover, the manufacture approach of a double-sided printed wiring board that the contact pads which are used for the base substrate of the multilayer-interconnection substrate of above-mentioned this invention, and are connected to the conductor and said conductor of the interlayer connection through hole made up for were prepared is constituted as following. a primary method -- (1) penetration plating through hole -- having -- a surface -- said penetration plating through hole of the double-sided printed wiring board with which patterning of the conductor was carried out, and said conductor -- the surface of the process which fills up a gap with the insulator layer of an organic system macromolecule, and (2) this double-sided printed wiring board -- a conductor and a penetration plating through hole -- it is an approach including the process which forms the contact pads connected to the predetermined location of a conductor.

[0011] the second approach -- (1) penetration plating through hole -- having -- a surface -- the process into which a conductor fills up with the insulator layer of an organic system macromolecule said penetration plating through hole of the double-sided printed wiring board by which patterning is not carried out, and the surface of (2) this double-sided printed wiring board -- a conductor and a penetration plating through hole -- it is an approach including the process which forms the contact pads connected to the predetermined location of a conductor.

[0012] the inside of the above-mentioned process, and a penetration plating through hole -- having -- a surface -- said penetration plating through hole of the double-sided printed wiring board with which patterning of the conductor was carried out, and said conductor -- the process which fills up a gap with the insulator layer of an organic system macromolecule, and a penetration plating through hole -- having -- a surface -- the process into which a conductor fills up with the insulator layer of an organic system macromolecule said penetration plating through hole of the double-sided printed wiring board by which patterning is not carried out is explained in more detail.

[0013] Namely, the process which sandwiches the fluid organic system macromolecule precursor which installs metal mold with a flat front face on (1) this double-sided printed wiring board, and does not contain a solvent between this double-sided printed wiring board and this metal mold, (2) -- the process which exhausts between this metal mold and these double-sided printed wiring boards, and the fluid organic system macromolecule precursor which is made to move (3) this metal mold in this double-sided printed wiring board direction, and does not contain this solvent -- a penetration plating through hole and a conductor -- with the process with which a gap is filled up (4) -- the process which pours hydrostatic pressure on the fluid organic system macromolecule precursor which does not contain this solvent, the process which hardens the fluid organic system macromolecule precursor which does not contain (5) this solvent, and the conductor covered with organic (6) this system macromolecule -- it is an approach including the process at which a top face is exposed.

[0014] moreover, the surface of the inside of the above-mentioned process, and a double-sided printed wiring board -- a conductor and a penetration plating through hole -- the process which forms the contact

pads connected to the predetermined location of a conductor is explained in more detail. a primary method -- (1) penetration plating through hole or a penetration plating through hole, and a conductor -- the whole surface surface of the double-sided printed wiring board with which the gap was filled up with the insulator layer of an organic system macromolecule -- the object for pads -- the process which forms a conductor, and (2) -- this -- a conductor -- the process which forms the remnants pattern of a resist in the upper predetermined location, and (3) -- this -- it is a subtractive process including the process which carries out patterning of the conductor to a predetermined configuration by etching and exfoliates this resist.
[0015] the second approach -- (1) penetration plating through hole or a penetration plating through hole, and a conductor -- it is an additive process including the process at which a resist extracts in the predetermined location on the front face of a double-sided printed wiring board filled up with the insulator layer of an organic system giant molecule, and a gap forms a pattern in it, and the process which (2) this resist extracts, forms a conductor in a pattern, and exfoliates this resist. The double-sided printed wiring board with which the contact pads connected to the conductor and said conductor of the interlayer connection through hole made up for by the above approach were prepared can be manufactured.
[0016] How to form a thin film multilayer-interconnection layer on the base substrate of the above-mentioned double-sided printed wiring board is explained. the process which forms (1) photosensitivity insulation resin, the process which form a beer hall in this photosensitive insulation resin by (2) exposure and development, the process which roughen this photosensitive insulation resin front face by which (3) exposure was carried out, the process which carry out full hardening of this photosensitive insulation resin with the process which forms a conductor according to (4) (5) heat curing, and (6) -- this -- it is the build up method including the process which forms a pattern by etching of a conductor. [namely
[0017] Here, the ingredient used for this invention is explained in more detail. Either of the constituents which contain at least one or more of a polyfunctional epoxy resin constituent, the constituent of the compound which has two or more maleimide frames in intramolecular, the constituent of the compound which has two or more cyanic-acid ester frames in intramolecular, and the constituents of the compound which has two or more benz-cyclo-butene frames in intramolecular in the fluid organic system macromolecule precursor which does not contain a solvent is used.
[0018] Moreover, either of the constituents containing the constituent containing a polyfunctional unsaturated compound solid at a room temperature, an epoxy resin, an acrylate monomer, a photopolymerization initiator, and the heat-curing agent of an amine system or the polyfunctional solid epoxy resin of two or more organic functions to which the addition reaction of the partial saturation radical was carried out at least, an acrylate monomer, a photopolymerization initiator, and the heat-curing agent of an amine system is used for photosensitive insulation resin at least. Moreover, an amine system heat-curing agent has a dicyandiamide or a desirable diamino triazine compound.
[0019]
[Function] The work of each above-mentioned technical means is as follows. According to the configuration of the multilayer-interconnection substrate concerning this invention, on the double-sided printed wiring board with which the contact pads connected to the conductor and said conductor of the interlayer connection through hole made up for were prepared Since the conductor pattern layer and layer insulation membrane layer of at least one or more layers are formed by turns and these contact pads, said conductor pattern layer, and said conductor pattern layers are connected electrically The effect of the hole of the penetration plating through hole of the double-sided printed wiring board of a base substrate is lost, and a thin film multilayer-interconnection layer can be formed on this.
[0020] Moreover, since a penetration plating through hole is not formed in the culmination of a production process, the wiring consistency of the thin film multilayer-interconnection layer on a base substrate can be made into the maximum. Furthermore, even if there is no formation of the penetration plating through hole of a culmination [in / in connection between the thin film multilayer-interconnection layer on a **-SU substrate and the inner layer conductor layer of a base substrate, connection of both sides of a base substrate, connection of each conductor layer, etc. / a production process], it can give.
[0021] According to the manufacture approach of the double-sided printed wiring board concerning this invention, metal mold with a flat front face is installed on a double-sided printed wiring board with a penetration plating through hole. The process which sandwiches the fluid organic system macromolecule precursor which does not contain a solvent between this double-sided printed wiring board and this metal mold, the process which exhausts between this metal mold and these double-sided printed wiring boards, and the fluid organic system macromolecule precursor which is made to move this metal mold in this double-sided printed wiring board direction, and does not contain this solvent -- a penetration plating through hole and a conductor -- with the process with which a gap is filled up the process which pours

hydrostatic pressure on the fluid organic system macromolecule precursor which does not contain this solvent, the process which hardens the fluid organic system macromolecule precursor which does not contain this solvent, and the conductor covered with this organic system macromolecule, since it considered as the process including the process at which a top face is exposed the inside of a penetration through hole, or a conductor -- the insulator layer of uniform physical properties without a pinhole or a crack can be formed in a gap. moreover, the surface of this double-sided printed wiring board required in order to connect the contact pads formed in the following process -- the front face of a conductor can be exposed and a base substrate with a flat front face can be made.

[0022] furthermore, the above-mentioned double-sided printed wiring board surface -- a conductor and a penetration plating through hole -- the subtractive process or additive process which is not a special technique but the conventional technique as an approach of forming the contact pads linked to the predetermined location of a conductor is employable.

[0023] The process which forms a beer hall in this photosensitive insulation resin next by the process which forms photosensitive insulation resin, exposure, and development according to the manufacture approach of the multilayer-interconnection substrate concerning this invention, It writes as the approach of passing through the process which roughens this exposed photosensitive insulation resin front face, the process which forms a conductor, the process which carries out full hardening of this photosensitive insulation resin according to heat curing, and the process which makes said conductor forming in a pattern by etching. The bond strength of said conductor which had become a problem from the former, and an interlayer insulation film can be raised, and a reliable thin film multilayer-interconnection layer can be formed.

[0024] the above-mentioned penetration plating through hole or a conductor -- an ingredient applicable in order to fill a gap It is the fluid organic system macromolecule precursor which does not contain a solvent. At least one or more of a polyfunctional epoxy resin constituent, the constituent of the compound which has two or more maleimide frames in intramolecular, the constituent of the compound which has two or more cyanic-acid ester frames in intramolecular, and the constituents of the compound which has two or more benz-cyclo-butene frames in intramolecular By using the included constituent, the insulator layer excellent in thermal resistance, the mechanical characteristic, the electrical property, etc. can be obtained.

[0025] moreover -- the above-mentioned photosensitive insulation resin -- the above, in order to raise the bond strength of a conductor and an interlayer insulation film The component hardened with light and the component hardened with heat are required. At least The constituent containing a polyfunctional unsaturated compound solid at a room temperature, an epoxy resin, an acrylate monomer, a photopolymerization initiator, and the heat-curing agent of an amine system, Or it excels in the bond strength of a conductor and an interlayer insulation film, and good definition is also acquired by either of the constituents which contain at least the polyfunctional solid epoxy resin of two or more organic functions to which the addition reaction of the partial saturation radical was carried out, an acrylate monomer, a photopolymerization initiator, and the heat-curing agent of an amine system. Furthermore, the migration of a conductor can be suppressed by having used the dicyandiamide or the diamino triazine compound for the amine system heat-curing agent.

[0027]

[Example] Hereafter, each example of this invention is explained with reference to drawing 1 thru/or drawing 7 .

[Example 1] The explanatory view showing the double-sided printed wiring board which drawing 1 requires for one example of this invention, and its manufacture approach, and drawing 5 are the explanatory views showing the manufacture approach of the double-sided printed wiring board concerning one example of this invention. In drawing 1 , an example of the manufacture approach of a double-sided printed wiring board that the contact pads linked to the conductor and said conductor of the interlayer connection through hole made up for were prepared is explained.

[0028] It has two kinds of penetration plating through holes 102 and 103 which take connection with the penetration plating through hole 101 and the voltage plane on the back which connect a double-sided signal plane, and double-sided copper prepares the glass polyimide double-sided printed wiring board shown in drawing 1 (a) by which patterning was carried out. It does not interfere, even if it uses as said printed wired board, the printed wired board, for example, Mitsubishi Gas Chemical Co., Inc. make, of BT resin.

[0029] the next -- the penetration plating through hole of this printed wired board, and a surface -- although the substrate which fills up the gap of a conductor with the insulator layer 104 of an organic system macromolecule, and is shown in drawing 1 (b) is created, it is the die builder a process in the

meantime is indicated to be to drawing 5 . As shown in drawing 5 (a), it faces across both sides of the printed wired board of said drawing 1 (a) with the film-like constituent 105, and this is inserted between metal mold 501.
[0030] In this example, said film-like constituent 105 kneads the fluid organic system macromolecule precursor EXA4700 (trade name made from Dainippon Ink Chemistry Manufacture) which does not contain a solvent, for example, 4 organic-functions POKISHI resin Epiclon, and phenol resin Varcum TD2131 (trade name made from Dainippon Ink Chemistry Manufacture) 65phr, and carries out melting shaping.
[0031] Subsequently, said metal mold 501 is heated at 70 degrees C, melting of the above-mentioned film-like constituent 105 is carried out, further, the space of said metal mold 501 and said printed wired board is exhausted to 10torr(s), and a degree of vacuum is held for about 7 minutes. Thereby, the penetration plating through holes 101, 102, and 103 and a copper wiring gap were filled up with the above-mentioned film-like constituent 105, and it constituted the substrate shown in drawing 5 (b).
[0032] And after returning the space of said printed wired board of said metal mold 501 and drawing 5 (b) to atmospheric pressure, it pressurizes from a longitudinal direction by compression-pressure 5 kgf/cm2 by pneumatic pressure 4.5 kgf/cm2 from [from the upper and lower sides] a longitudinal direction. The temperature up of the inclination rate was carried out for said metal mold 501 in a part for 70-degree-C/from 70 degrees C to 200 degrees C after 5 minutes, and it held for 30 minutes in the condition.
[0033] And the printed wired board of said drawing 5 (b) is removed from metal mold 501, and 200 degrees C is heated under ordinary pressure for 60 minutes. consequently, the insulator layer 104 which is flat, and there is neither a void nor a pinhole and has uniform physical properties -- the penetration plating through holes 101, 102, and 103 and surface wiring -- a conductor -- it is formed in a gap. Consequently, the printed wired board shown in drawing 5 (c) was obtained.
[0034] the printed wired board of drawing 5 (c) -- a surface -- a conductor -- the ultra-thin film of an insulator layer 104 remains in top 106. then, the thing which the printed wired board of drawing 5 (c) is heated at 100 degrees C, and is put to ultraviolet rays under the ambient atmosphere for [O3] 20 minutes -- an insulator layer 104 -- etchback -- carrying out -- a surface -- the printed wired board of drawing 5 (d) to which the conductor was exposed, i.e., the printed wired board of drawing 1 (b), was obtained.
[0035] As conditions for the mold in said metal mold 501, the compression pressure of two or less 20 kgf/cm and the vertical direction of 20 or less Torrs and a pressure is larger than the compression pressure from a longitudinal direction, or the thing of a degree of vacuum equal at least is desirable, and a still better result is obtained with the differential pressure being two or less 10 kgf/cm. Furthermore, oxygen plasma ashing, polish, etc. can also be used as the approach of etchback.
[0036] Thus, in printed wired board both sides of formed drawing 1 (b), the copper substrate film was formed in thickness of 0.5 micrometers in the spatter, and, subsequently the printed wired board shown in drawing 1 (c) which formed [the thickness of 15 more micrometers] copper 107 all over increase and said printed wired board both sides with the usual electrolytic copper plating was obtained. In addition to this as an approach of forming said copper 107, the conventional techniques, such as ion plating, and ****, chemical plating, can be used.
[0037] Next, etching resist was formed with the conventional technique on copper 107, and the double-sided printed wiring board which has the contact pads 108 which carry out patterning of the copper 107 according to the process of exposure, development, etching, and exfoliation, and are connected with the conductor of the interlayer connection through hole made up for, and other patterns, i.e., the completed double-sided printed wiring board of drawing 1 (d), was obtained.
[0038] [Example 2] Next, the double-sided printed wiring board concerning other one example of this invention is explained with reference to drawing 1 and 2. Drawing 2 is the explanatory view showing the double-sided printed wiring board concerning other one example in this invention. Even the double-sided printed wiring board shown in drawing 1 (b) like [example 1] forms.
[0039] Subsequently, although the double-sided printed wiring board shown in drawing 1 (d) by the so-called subtractive process was obtained in [example 1], in this example, contact pads 201 were formed with the so-called additive process.
[0040] That is, after forming plating resist in both sides of the double-sided printed wiring board of drawing 1 (b) with the predetermined conventional technique, and predetermined extracting by exposure and development and obtaining a pattern, contact pads 201 are formed in chemistry copper plating, and a resist is exfoliated. Thus, the double-sided printed wiring board with which the contact pads connected to the conductor and said conductor of the interlayer connection through hole which is shown in drawing 2 , and which was made up for were prepared was completed.
[0041] [Example 3] Next, the manufacture approach of the double-sided printed wiring board concerning

one example of further others of this invention is explained with reference to drawing 1 and 3. Drawing 3 is the explanatory view showing the manufacture approach of the double-sided printed wiring board concerning one example of further others in this invention. Even the double-sided printed wiring board shown in drawing 1 (b) like [example 1] forms.

[0042] It has two kinds of penetration plating through holes 302 and 303 which take connection with the penetration plating through hole 301 and the voltage plane on the back which connect the signal plane of both sides shown in drawing 3 , and the glass polyimide double-sided printed wiring board with which double-sided copper is shown in drawing 3 (a) by which patterning is not carried out is prepared.

[0043] Next, it considers as the substrate which fills up the penetration plating through hole of this double-sided printed wiring board with the insulator layer 304 of an organic system macromolecule, and is shown in drawing 3 (b) like [example 1]. After having formed plating resist in both sides of the substrate of drawing 3 (b) by the conventional approach, and predetermined having extracted by exposure and development and obtaining a pattern, contact pads 305 were formed in chemistry copper plating, and the resist was used as the double-sided printed wiring board which exfoliates and is shown in drawing 3 (c).

[0044] And etching resist is formed by the predetermined approach on this, and the double-sided printed wiring board shown in drawing 3 (d) which has the contact pads 306 which carry out patterning of the copper 306 according to the process of exposure, development, etching, and exfoliation, and are connected with the conductor of the interlayer connection through hole made up for, and other patterns is obtained.

[0045] [Example 4] Next, with reference to drawing 3 and 4, one example of further others of this invention is explained. Drawing 4 is the explanatory view showing the double-sided printed wiring board concerning one example of further others in this invention. Even the double-sided printed wiring board shown in drawing 3 (b) like [example 3] formed, and, subsequently to the whole double-sided surface of the double-sided printed wiring board of drawing 3 (b), copper was formed in thickness of 15 micrometers like [example 1].

[0046] And etching resist is formed by the predetermined approach on this, and patterning of the copper is carried out according to the process of exposure, development, etching, and exfoliation. Consequently, the double-sided printed wiring board which has the contact pads 401 linked to the conductor of the interlayer connection through hole which is shown in drawing 4 , and which was made up for and other patterns was obtained.

[0047] [Example 5] Next, the manufacture approach of drawing 1 and the multilayer-interconnection substrate applied to one example of further others of this invention with reference to 6 and 7 is explained. The explanatory view of the manufacture approach of the multilayer-interconnection substrate which drawing 6 requires for one example of further others of this invention, and drawing 7 are the explanatory views of the multilayer-interconnection substrate concerning one example of further others of this invention.

[0048] The double-sided printed wiring board with which the contact pads linked to the conductor of the interlayer connection through hole which was shown in drawing 1 (d) formed by the approach of [example 1], and which was made up for were prepared is used, and the multilayer-interconnection substrate by which the thin film multilayer-interconnection layer was formed by the build up method on it, and its manufacture approach are explained.

[0049] It was used in this example, having adjusted the resin constituent which consists of the following (b) - (**) as photosensitive insulation resin of exposure / development process.

(b) Diallyl phthalate resin 100g (b) Epicoat 828 30g (Ha) Pentaerythritol thoria KURIRE-TO 20g (d) benzoin iso-propyl ether 4g (e) dicyandiamide 4g (**) -- 2 and 4-diamino-6-[2'-methyl imidazolyl-(1')]- Ethyl-s-triazine 1g (**) -- in addition to this (additive for the improvement in a spreading property) -- Optimum dose [0050] First, the resin constituent which mixed the solvent (ethylcellosolve) of above-mentioned - (Ha) and above-mentioned (**), and optimum dose was formed, and heating churning was carried out for 30 minutes at 80 degrees C. Next, after making said resin constituent into ordinary temperature, other component (d)s - (g) were mixed, for example, it kneaded with 3 rolls, and photosensitive insulation resin was obtained. The above-mentioned photosensitive insulation resin 601 was applied to both sides of the double-sided printed wiring board shown in drawing 1 (d) 50 micrometers in thickness with the spray coater, predrying for 30 minutes was performed at 80 degrees C, and the substrate shown in drawing 6 (a) was obtained.

[0051] Subsequently, the substrate which carries out pattern exposure, develops negatives by ultraviolet radiation, forms a beer hall 602, carries out complete exposure further, and is shown in drawing 6 (b) was obtained for 2 minutes using the 400W high-pressure mercury lamp. Then, in order to secure the bond strength of said resin film and the plating coat formed at a back process, the resin front face was

roughened. The roughening liquid and the roughening conditions which were used are as follows. Potassium permanganate 0.1 - 0.5 mol/l Sodium hydroxide 0.2 - 0.4 mol/l Solution temperature 50-90 degrees C [0052] Roughened by being immersed for 3 - 10 minutes, and it is immersed in a 50vol% hydrochloric acid for 3 minutes, it was made to neutralize the substrate shown in above-mentioned drawing 6 (b), it rinsed and dried behind, and the roughening layer was formed. Next, in order to activate a roughening layer, after being immersed in catalytic liquid and forming the substrate electric conduction film in the thickness of 0.2 micrometers with non-electrolytic copper plating, in order to carry out full hardening of the resin layer, heat hardening was performed for 30 minutes at 150 degrees C, and, finally thickness attachment electrolytic copper plating 603 was used as the substrate which gives 15 micrometers and is shown in drawing 6 (c).
[0053] Catalyst processing liquid, others, and processing conditions are shown below.
(Catalyst processing liquid) ** KYATAPU lip 404 by the SHIPPURE-company (270 g/l) 45 degrees C, 3 minute ** KYATAPU lip 404 (270 g/l) 45 degrees C, 5 minutes KYATAPOJITTO 44 (30 ml/l)
** Accelator A room temperature, 3 minutes [0054]
(Electric conduction film) SHIPPURE-company make Kappa-mix 328A (125 ml/l) A room temperature, 1 minute Kappa-mix 328L (125 ml/l)
Kappa-mix 328C (25 ml/l)
[0055]
(Copper-plating pretreatment)
new trad -- clean (50vol%) A room temperature and 3 minutes Sulfuric acid treatment (10vol%) A room temperature and 1 minute [0056] (Thickness attachment electrolytic copper plating)
CuSO4and5H2O (75 ml/l)
H2SO4 (98ml/l)
HCl (0.15ml/l)
Cu-board HA makeup (10 ml/l) Solution temperature made from Ebara You JIRAITO Room temperature current density 2 A/dm2 [0057] Next, etching resist is formed in a substrate by the usual approach, patterning of the copper 603 is carried out according to the process of exposure, development, etching, and exfoliation, the catalyst between still more unnecessary circuits is removed, and the layer [1st] conductor pattern layer 604 is formed. Consequently, the substrate shown in drawing 6 (d) was obtained.
[0058] Removal of a catalyst was immersed in the strong-base water solution of 5wt%NaOH for 10 minutes, was carried out, and was carried out like the above also about formation of a conductor pattern layer (the 2nd layer and the 3rd layer). The multilayer-interconnection substrate which forms a solder resist in a front face and is finally shown in drawing 7 was obtained.
[0059] As for the lamination of the multilayer-interconnection substrate shown in drawing 7 , 701 and 708 serve both as a cap and a grand layer, and a signal plane, and 704 and 705 are [702,703 and 706,707] two kinds of voltage planes. The contact pads 709 connected with the penetration plating through hole made up for and said through hole connect with the voltage plane of between the signal planes of the front flesh side of a base substrate, and a rear face.
[0060] [Example 6] Next, the manufacture approach of the multilayer-interconnection substrate applied to one example of further others of this invention with reference to drawing 7 is explained. Drawing 7 is the explanatory view of the multilayer-interconnection substrate concerning one example of further others of this invention. In [example 5], although the substrate electric conduction film was formed in the thickness of 0.2 micrometers with non-electrolytic copper plating like the above, in [example 6], the following non-electrolyzed nickel plating was performed as substrate electric conduction film, and the multilayer-interconnection substrate shown in drawing 7 by the same approach as [example 5] was obtained.
[0061]
(Non-electrolyzed nickel-plating liquid)
Bull-Shue Ma - (nickel-P) Undiluted solution use Product made from KANIZEN Solution temperature 80 degrees C Plating time amount The nickel of the bond strength with resin is [the 5 minute substrate electric conduction film] larger than copper.
[0062] [Example 7] Next, the manufacture approach of drawing 1 and the multilayer-interconnection substrate applied to one example of further others of this invention with reference to 7 is explained. the front face of the double-sided printed wiring board shown in drawing 1 (d) -- other conditions obtained the multilayer-interconnection substrate shown in drawing 7 like [example 5] using following chromate acid mixture roughening liquid and following conditions using protection of a conductor and the non-electrolyzed nickel plating same on the substrate electric conduction film as [example 6] as roughening liquid and roughening conditions.

[0063]
Chromate acid mixture roughening liquid and conditions Chromic anhydride 2.0 mol/l - saturated concentration Sulfuric acid 3.6 - 6 mol/l Solution temperature 50-80 degrees C Time amount 3 - 10 minutes Alkali neutralization processing 5 - 10 minutes [0064] [Example 8] Next, the manufacture approach of drawing 2 and the multilayer-interconnection substrate applied to one example of further others of this invention with reference to 7 is explained. The multilayer-interconnection substrate shown in drawing 7 by the build up method as [example 6] it is the same on this, and the multilayer-interconnection substrate which constituted the same layer were manufactured using the double-sided printed wiring board with which the contact pads connected to the conductor and said conductor of the interlayer connection through hole which is shown in drawing 2 formed by the approach of [example 2], and which was made up for were prepared.
[0065] [Example 9] Next, the manufacture approach of drawing 3 and the multilayer-interconnection substrate applied to one example of further others of this invention with reference to 7 is explained. The multilayer-interconnection substrate shown in drawing 7 by the build up method as [example 6] it is the same on this, and the multilayer-interconnection substrate of the same lamination were manufactured using the double-sided printed wiring board with which the contact pads linked to the conductor of the interlayer connection through hole which is shown in drawing 3 (d) formed by the approach of [example 3], and which was made up for were prepared.
[0066] [Example 10] Next, the manufacture approach of drawing 4 and the multilayer-interconnection substrate applied to one example of further others of this invention with reference to 7 is explained. The multilayer-interconnection substrate of drawing 7 and the multilayer-interconnection substrate of the same lamination were manufactured by the same build up method as [example 6] on this using the double-sided printed wiring board with which the contact pads connected to the conductor and said conductor of the interlayer connection through hole which is shown in drawing 4 formed by the approach of [example 4], and which was made up for were prepared.
[0067] If the multilayer-interconnection substrate of each above-mentioned example is compared with the usual multilayer-interconnection substrate which takes an interlayer connection in a penetration through hole or interstitial via hole If a grid pitch is set to 1.27mm and the wiring consistency (the number of grids and a wire length are taken into consideration) when calculating for being able to form wiring of two between grids is set to 1 Since the thin film multilayer-interconnection layer formed by the build up method of the multilayer-interconnection substrate of this example can form wiring of at least two in grid pitch 0.635mm, a relative wiring consistency can be made into twice [about].
[0068] When it makes area the same, and a signal number of layers is conversely made the same for a signal number of layers one half, this becomes the count which can set area to one half, and the effectiveness of densification and cost reduction is large. On the other hand, when a penetration plating through hole is formed in the culmination of manufacture, wiring of the surface integral will be lost.
[0069] each above-mentioned example -- both the surfaces of a double-sided printed wiring board -- although the multilayer-interconnection substrate which makes a conductor two kinds of voltage planes, forms in these both sides one layer which served both as XY signal plane two-layer, and a gland and a cap layer, and grows into them, and its manufacture approach were explained, this invention is not limited to lamination, and even if 4 lamellaes which put XY signal plane two-layer into the inner layer of the above-mentioned double-sided printed wiring board are used for it, it does not interfere.
[0070] Also about said film constituent of the fluid organic system macromolecule precursor which does not contain a solvent, moreover, in the above-mentioned example Although what kneaded 4 organic-functions POKISHI resin Epiclon EXA4700 (trade name made from Dainippon Ink Chemistry Manufacture) and phenol resin Varcum TD2131 (trade name made from Dainippon Ink Chemistry Manufacture) 65phr, and carried out melting shaping was used It does not interfere, even if it uses the SHISUBISUBENZO cyclo butenyl ethene which heated for 5 hours and oligomerized at 180 degrees C which is BT-3309T (trade name by Mitsubishi Gas Chemical Co., Inc.) and the benz-cyclo-butene system ingredient which are bismaleimide / cyanic-acid ester system ingredient. As for the curing temperature in that case, it is desirable respectively to consider as 220 degrees C and 250 degrees C.
[0071]
[Effect of the Invention] As explained to the detail above, according to this invention, it excels in properties, such as thermal resistance, a mechanical characteristic, and an electrical property, and the manufacture approach of the double-sided printed wiring board used for the multilayer-interconnection substrate which has a high density wiring function without the effect of the hole of a penetration plating through hole where low cost and dependability are high, its manufacture approach of utilizing for the

maximum the original high density wiring function which the build up method can form, and said multilayer-interconnection substrate can be offered.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the explanatory view showing the double-sided printed wiring board concerning one example of this invention, and its manufacture approach.
[Drawing 2] It is the explanatory view showing the double-sided printed wiring board concerning other one example in this invention.
[Drawing 3] It is the explanatory view showing the manufacture approach of the double-sided printed wiring board concerning one example of further others in this invention.
[Drawing 4] It is the explanatory view showing the double-sided printed wiring board concerning one example of further others in this invention.
[Drawing 5] It is the explanatory view showing the manufacture approach of the double-sided printed wiring board concerning one example of this invention.
[Drawing 6] It is the explanatory view of the manufacture approach of the multilayer-interconnection substrate concerning one example of further others of this invention.
[Drawing 7] It is the explanatory view of the multilayer-interconnection substrate concerning one example of further others of this invention.
[Description of Notations]
101 Penetration Plating through Hole Which Connects Double-sided Signal Plane
102 Penetration Plating through Hole Which Takes Connection with Voltage Plane on the Back
103 Penetration Plating through Hole Which Takes Connection with Voltage Plane on the Back
104 Insulator Layer of Organic System Macromolecule
105 Film-like Constituent of Fluid Organic System Macromolecule Precursor Which Does Not Contain Solvent
106 Surface -- Conductor -- Section
107 Copper
108 Contact Pads Linked to Conductor of Interlayer Connection through Hole Made Up For
201 Contact Pads Linked to Conductor of Interlayer Connection through Hole Made Up For
301 Penetration Plating through Hole Which Connects Double-sided Signal Plane
302 Penetration Plating through Hole Which Takes Connection with Voltage Plane on the Back
303 Penetration Plating through Hole Which Takes Connection with Voltage Plane on the Back
304 Organic System Macromolecule Insulator Layer
305 Contact Pads
306 Copper
401 Contact Pads
501 Metal Mold
601 Photosensitive Insulation Resin
602 Beer Hall
603 Copper
604 Conductor Pattern Layer
701 Grand Layer Which Serves as Cap Layer
702 Signal Plane
703 Signal Plane
704 Voltage Plane
705 Voltage Plane
706 Signal Plane

707 Signal Plane
708 Grand Layer Which Serves as Cap Layer
709 Contact Pads

[Translation done.]

* NOTICES *

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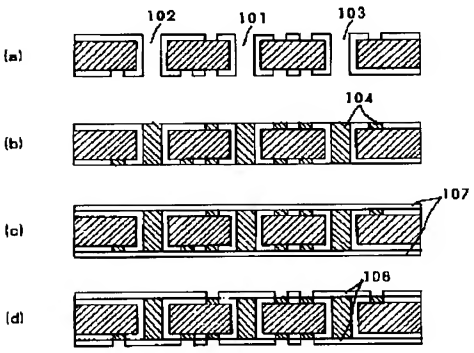
DRAWINGS

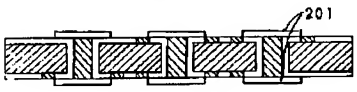
[Drawing 1]

図 1



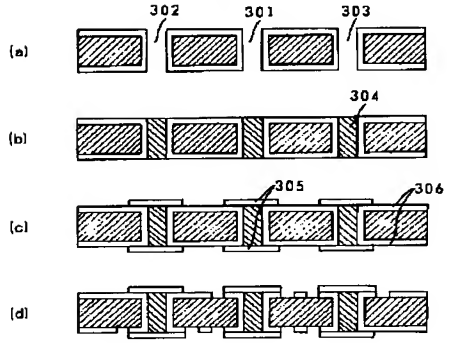
[Drawing 2]

図 2



[Drawing 3]

図 3

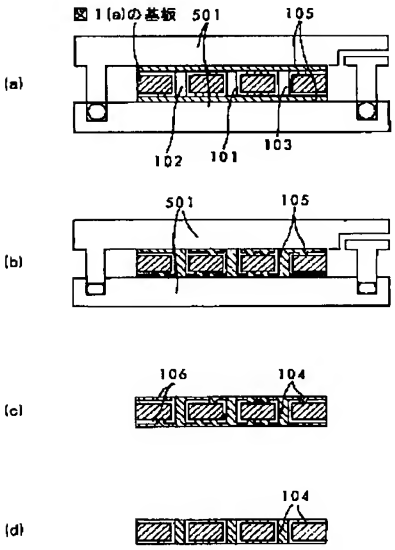


[Drawing 4]

図 4

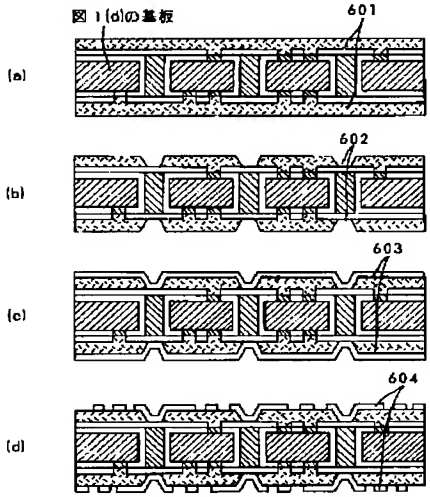
[Drawing 5]

図 5



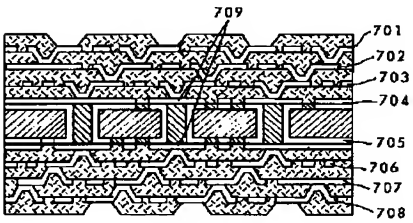
[Drawing 6]

図 6



[Drawing 7]

図 7



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最終頁に続く

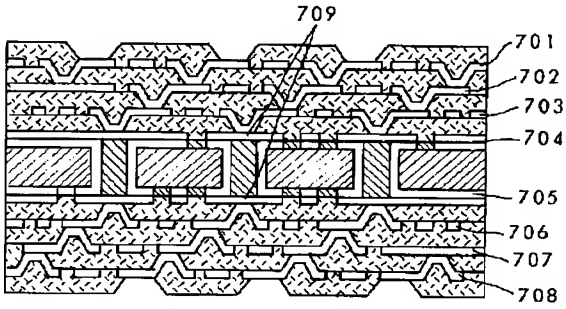
(54)【発明の名称】　多層配線基板とその製造方法および両面プリント配線板の製造方法

(57)【要約】

【目的】　耐熱性、機械特性、電気特性等の特性に優れ、低コスト、かつ、信頼性の高い、貫通めっきスルーホールの穴の影響をなくし、高密度配線機能を有する多層配線基板，ビルドアップ法が形成しうる本来の高密度配線機能を最大限に活用するその製造方法および前記多層配線基板に用いられる両面プリント配線板の製造方法を提供する。

【構成】　穴埋めされた層間接続スルーホールの導体１０１，１０２，１０３と接続する導体パッド７０９が設けられた両面プリント配線板上に、少なくとも１層以上の導体パターン層６０４と層間を絶縁する絶縁膜３０４とが交互に形成され、該導体パッド７０９と導体パターン層６０４および導体パターン層６０４同士を電気的に接続したものである。

図　7



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【特許請求の範囲】

【請求項１】　穴埋めされた層間接続スルーホールの導体と接続する導体パッドが設けられた両面プリント配線板上に、少なくとも１層以上の導体パターン層と層間絶縁膜層とが交互に形成され、該導体パッドと導体パターン層および導体パターン層同士が電気的に接続されて成る多層配線基板。

【請求項２】　（１）貫通めっきスルーホールを有し、表層導体がパターニングされた両面プリント配線板の前記貫通めっきスルーホールおよび前記導体間隙を有機系高分子の絶縁膜で充填する工程と、

（２）該両面プリント配線板の表層導体および貫通めっきスルーホール導体の所定位置に接続する導体パッドを形成する工程とを含む穴埋めされた層間接続スルーホールの導体と前記導体に接続される導体パッドが設けられた両面プリント配線板の製造方法。

【請求項３】　（１）貫通めっきスルーホールを有し、表層導体がパターニングされていない両面プリント配線板の前記貫通めっきスルーホールを有機系高分子の絶縁膜で充填する工程と、

（２）該両面プリント配線板表層導体および貫通めっきスルーホール導体の所定位置に接続する導体パッドを形成する工程とを含む穴埋めされた層間接続スルーホールの導体と前記導体に接続される導体パッドが設けられた両面プリント配線板の製造方法。

【請求項４】　貫通めっきスルーホールを有し、表層導体がパターニングされた両面プリント配線板の前記貫通めっきスルーホールおよび前記導体間隙を有機系高分子の絶縁膜で充填する工程が、

（１）該両面プリント配線板上に表面の平坦な金型を設置し、該両面プリント配線板と該金型との間に溶剤を含まない流動性有機系高分子前駆体を挟む工程と、

（２）該金型と該両面プリント配線板との間を排気する工程と、

（３）該金型を該両面プリント配線板方向へ移動させて該溶剤を含まない流動性有機系高分子前駆体を前記貫通めっきスルーホールおよび前記導体間隙に充填する工程と、

（４）該溶剤を含まない流動性有機系高分子前駆体に静水圧をかける工程と、

（５）該溶剤を含まない流動性有機系高分子前駆体を硬化する工程と、

（６）該有機系高分子で覆われた前記導体上面を露出させる工程と、

を含むことを特徴とする穴埋めされた層間接続スルーホールの導体と前記導体に接続される導体パッドが設けられた両面プリント配線板の製造方法。

【請求項５】　貫通めっきスルーホールを有し、表層導体がパターニングされていない両面プリント配線板の前記貫通めっきスルーホールを有機系高分子の絶縁膜で充

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填する工程が、

（１）該両面プリント配線板上に表面の平坦な金型を設置し、該両面プリント配線板と該金型との間に溶剤を含まない流動性有機系高分子前駆体を挟む工程と、

（２）該金型と該両面プリント配線板との間を排気する工程と、

（３）該金型を該両面プリント配線板方向へ移動させて該溶剤を含まない流動性有機系高分子前駆体を前記貫通めっきスルーホールおよび前記導体間隙に充填する工程と、

（４）該溶剤を含まない流動性有機系高分子前駆体に静水圧をかける工程と、

（５）該溶剤を含まない流動性有機系高分子前駆体を硬化する工程と、

（６）該有機系高分子で覆われた前記導体上面を露出させる工程とを含むことを特徴とする穴埋めされた層間接続スルーホールの導体と前記導体に接続される導体パッドが設けられた両面プリント配線板の製造方法。

【請求項６】　両面プリント配線板の表層導体および貫通めっきスルーホール導体の所定位置に接続する導体パッドを形成する工程が、

（１）前記貫通めっきスルーホールまたは前記貫通めっきスルーホールと前記表層導体の間隙とが有機系高分子の絶縁膜で充填された両面プリント配線板の表面全面にパッド用導体を形成する工程と、

（２）該導体上の所定位置にレジストの残しパターンを形成する工程と、

（３）該導体をエッチングにより所定の形状にパターニングし、該レジストを剥離する工程とを含むことを特徴とする穴埋めされた層間接続スルーホールの導体と前記導体に接続される導体パッドが設けられた両面プリント配線板の製造方法。

【請求項７】　両面プリント配線板の表層導体および貫通めっきスルーホール導体の所定位置に接続する導体パッドを形成する工程が、

（１）前記貫通めっきスルーホールまたは前記貫通めっきスルーホールと前記導体間隙とが有機系高分子の絶縁膜で充填された両面プリント配線板表面の所定位置にレジストの抜きパターンを形成する工程、

（２）該レジストの抜きパターン内に導体を形成し、該レジストを剥離する工程とを含むことを特徴とする穴埋めされた層間接続スルーホールの導体と前記導体に接続される導体パッドが設けられた両面プリント配線板の製造方法。

【請求項８】　穴埋めされた層間接続スルーホールの導体と前記導体に接続される導体パッドが設けられたプリント配線板上に、

（１）感光性絶縁樹脂を成膜する工程と、

（２）露光、現像により該感光性絶縁樹脂にビアホールを形成する工程と、

（３）露光された該感光性絶縁樹脂表面を粗化する工程と、
（４）導体を形成する工程と、
（５）熱硬化により該感光性絶縁樹脂を完全硬化する工程と、
（６）該導体のエッチングによりパターンを形成する工程とを繰り返し、多層化することを特徴とする請求項１記載の多層配線基板の製造方法。
【請求項９】　溶剤を含まない流動性有機系高分子前駆体が、多官能エポキシ樹脂組成物，分子内に２個以上のマレイミド骨格を有する化合物の組成物，分子内に２個以上のシアン酸エステル骨格を有する化合物の組成物，分子内に２個以上のベンゾシクロブテン骨格を有する化合物の組成物の内、少なくとも１つ以上を含むいずれかの組成物であることを特徴とする請求項４，５記載のいずれかの両面プリント配線板の製造方法。
【請求項１０】　感光性絶縁樹脂が、少なくとも、室温において固形の多官能不飽和化合物，エポキシ樹脂，アクリレートモノマー，光重合開始剤，アミン系の熱硬化剤を含む組成物あるいは不飽和基を付加反応させた２官能以上の多官能固形エポキシ樹脂，アクリレートモノマー，光重合開始剤，アミン系の熱硬化剤を含む組成物のいずれかであることを特徴とする請求項８記載の多層配線基板の製造方法。
【請求項１１】　アミン系熱硬化剤が、ジシアンジアミドまたはジアミノトリアジン化合物のいずれかであることを特徴とする請求項１０記載の多層配線基板の製造方法。
【発明の詳細な説明】
【０００１】
【産業上の利用分野】本発明は、大型計算機やワークステーション等のコンピュータ、交換機等に使われる高密度な多層配線基板およびその製造方法、並びに前記多層配線基板に用いられる両面プリント配線板の製造方法に関する。
【０００２】
【従来の技術】近年、従来の多層配線基板およびその製造方法に替わる新しい高密度な多層配線基板およびその製造方法が提案されている。例えば、ビルドアップ法が挙げられる。この方法は、基本的には表層導体がパターニングされたプリント配線板の表層に感光性絶縁材料を成膜した後、露光・現像によりビアホールを形成し、次いで、表層全面に導体を形成した後、導体をパターニングする。さらに、これを繰り返して多層化した後、最後に、貫通めっきスルーホールを形成する方法である。
【０００３】この方法においては、プリント配線板の表層導体とビルドアップの導体層およびビルドアップの導体層同士の接続が、ドリリングによる貫通めっきスルーホールによる接続でなく、コンフォーマルビアにより接続される。そのため、従来の貫通めっきスルーホールのみで層間接続をとるプリント配線板に比べると高密度な多層配線基板が得られる。しかしながら、プリント配線板の表層導体と内層導体との接続，プリント配線板両面の接続は、製造工程の最終段階で形成される貫通めっきスルーホールによる接続であるために、この分、配線密度が低下する欠点がある。
【０００４】また、ドリリングにより形成し、穴埋めされていない貫通めっきスルーホールを有するプリント配線板上では、感光性絶縁材料を成膜できないために、ビルドアップ法による薄膜多層配線層を形成できない。なお、これに関連するものとしては、特開平４－１４８５９０号公報記載の技術が知られている。
【０００５】前記技術の改良として、層間接続のためにドリリングで形成しためっきスルーホールの穴を樹脂充填し、上部にめっきスルーホールと前記導体に接続される導体パッドを形成してめっきスルーホールの面積を有効利用する多層配線基板の製造方法がある。これに関連するものとしては、例えば特開平４－１６８７９４号公報に示される方法がある。
【０００６】上記方法は、多層配線基板の隣接する２層の導体層の接続には有効であるが、プリント配線板の両面あるいは１層以上の導体層を隔てた２層の導体層の接続には、やはり、製造工程の最終段階で形成する貫通めっきスルーホールに頼らざるを得えず、出来上がった多層配線基板には穴埋めされていない貫通めっきスルーホールが残るという欠点がある。
【０００７】
【発明が解決しようとする課題】上記従来の技術では、ベースのプリント配線板に貫通めっきスルーホールがある場合はビルドアップ法は適用できない問題があった。貫通めっきスルーホールのないベースのプリント配線板上にビルドアップ法を適用し、薄膜多層配線層を形成したとしても、ビルドアップで形成した導体層とベースのプリント配線板の内層導体間の接続あるいはベースのプリント配線板の両面の接続をとるために、製造工程の最終段階で貫通めっきスルーホールを形成しなければならないという問題がある。上記貫通めっきスルーホールの製造工程最終段階にて形成することは、穴埋めされていない貫通めっきスルーホールが残存するという問題があり、さらに、高密度配線が形成できるビルドアップ法の本来の機能を最大限に活用することはできないという問題があった。
【０００８】本発明は、上記従来技術の問題点を解決するためになされたもので、耐熱性、機械特性、電気特性等の特性に優れ、低コスト、かつ、信頼性が高い、貫通めっきスルーホールの穴の影響をない、高密度配線機能を有する多層配線基板，ビルドアップ法が形成しうる本来の高密度配線機能を最大限に活用するその製造方法および前記多層配線基板に用いられる両面プリント配線板の製造方法を提供することを目的とするものである。

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【０００９】

【課題を解決するための手段】上記目的を達成するために、本発明に係る多層配線基板の構成は、穴埋めされた層間接続スルーホールの導体と前記導体に接続される導体パッドが設けられた両面プリント配線板上に、少なくとも１層以上の導体パターン層と層間絶縁膜層とが交互に形成され、該導体パッドと前記導体パターン層および前記導体パターン層同士が電気的に接続するものである。上記両面プリント配線板は内層導体層を含んでいても差し支えない。

【００１０】また、上記本発明の多層配線基板のベース基板に用いられ、穴埋めされた層間接続スルーホールの導体と前記導体に接続される導体パッドが設けられた両面プリント配線板の製造方法は次の如く構成する。第一の方法は、（１）貫通めっきスルーホールを有し、表層導体がパターニングされた両面プリント配線板の前記貫通めっきスルーホールおよび前記導体間隙を有機系高分子の絶縁膜で充填する工程、（２）該両面プリント配線板の表層導体および貫通めっきスルーホール導体の所定位置に接続される導体パッドを形成する工程とを含む方法である。

【００１１】第二の方法は、（１）貫通めっきスルーホールを有し、表層導体がパターニングされていない両面プリント配線板の前記貫通めっきスルーホールを有機系高分子の絶縁膜で充填する工程と、（２）該両面プリント配線板の表層導体および貫通めっきスルーホール導体の所定位置に接続される導体パッドを形成する工程とを含む方法である。

【００１２】上記工程の内、貫通めっきスルーホールを有し、表層導体がパターニングされた両面プリント配線板の前記貫通めっきスルーホールおよび前記導体間隙を有機系高分子の絶縁膜で充填する工程と、貫通めっきスルーホールを有し、表層導体がパターニングされていない両面プリント配線板の前記貫通めっきスルーホールを有機系高分子の絶縁膜で充填する工程とをさらに詳しく説明する。

【００１３】すなわち、（１）該両面プリント配線板上に表面の平坦な金型を設置し、該両面プリント配線板と該金型との間に溶剤を含まない流動性有機系高分子前駆体を挟む工程と、（２）該金型と該両面プリント配線板との間を排気する工程と、（３）該金型を該両面プリント配線板方向へ移動させて該溶剤を含まない流動性有機系高分子前駆体を貫通めっきスルーホールおよび導体間隙に充填する工程と、（４）該溶剤を含まない流動性有機系高分子前駆体に静水圧をかける工程と、（５）該溶剤を含まない流動性有機系高分子前駆体を硬化する工程と、（６）該有機系高分子で覆われた導体上面を露出させる工程とを含む方法である。

【００１４】また、上記工程の内、両面プリント配線板の表層導体および貫通めっきスルーホール導体の所定位

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置に接続される導体パッドを形成する工程をさらに詳しく説明する。第一の方法は、（１）貫通めっきスルーホールまたは貫通めっきスルーホールと導体間隙とが有機系高分子の絶縁膜で充填された両面プリント配線板の表面全面にパッド用導体を形成する工程と、（２）該導体上の所定位置にレジストの残しパターンを形成する工程と、（３）該導体をエッチングにより所定の形状にパターニングし、該レジストを剥離する工程とを含むサブトラクティブ法である。

【００１５】第二の方法は、（１）貫通めっきスルーホールまたは貫通めっきスルーホールと導体間隙とが有機系高分子の絶縁膜で充填された両面プリント配線板表面の所定位置にレジストの抜きパターンを形成する工程と、（２）該レジストの抜きパターン内に導体を形成し、該レジストを剥離する工程とを含むアディティブ法である。以上の方法により、穴埋めされた層間接続スルーホールの導体と前記導体に接続される導体パッドが設けられた両面プリント配線板を製造することができる。

【００１６】上記両面プリント配線板のベース基板上に薄膜多層配線層を形成する方法を説明する。すなわち、（１）感光性絶縁樹脂を成膜する工程と、（２）露光、現像により該感光性絶縁樹脂にビアホールを形成する工程と、（３）露光された該感光性絶縁樹脂表面を粗化する工程と、（４）導体を形成する工程と、（５）熱硬化により該感光性絶縁樹脂を完全硬化する工程と、（６）該導体のエッチングによりパターンを形成する工程とを含むビルドアップ法である。

【００１７】ここで、本発明に用いられる材料をさらに詳しく説明する。溶剤を含まない流動性有機系高分子前駆体には、多官能エポキシ樹脂組成物，分子内に２個以上のマレイミド骨格を有する化合物の組成物，分子内に２個以上のシアン酸エステル骨格を有する化合物の組成物，分子内に２個以上のベンゾシクロブテン骨格を有する化合物の組成物の内の少なくとも１つ以上を含む組成物のいずれかを使用する。

【００１８】また、感光性絶縁樹脂は、少なくとも、室温で固形の多官能不飽和化合物，エポキシ樹脂，アクリレートモノマー，光重合開始剤，アミン系の熱硬化剤をふくむ組成物，あるいは、少なくとも、不飽和基を付加反応させた２官能以上の多官能固形エポキシ樹脂、アクリレートモノマー、光重合開始剤、アミン系の熱硬化剤を含む組成物の内のいずれかを使用する。また、アミン系熱硬化剤はジシアンジアミドあるいはジアミノトリアジン化合物が望ましい。

【００１９】

【作用】上記各技術的手段の働きは次のとおりである。本発明に係る多層配線基板の構成によれば、穴埋めされた層間接続スルーホールの導体と前記導体に接続される導体パッドとが設けられた両面プリント配線板上に、少なくとも１層以上の導体パターン層と層間絶縁膜層とが

交互に形成され、該導体パッドと前記導体パターン層および前記導体パターン層同士が電気的に接続されるので、ベース基板の両面プリント配線板の貫通めっきスルーホールの穴の影響がなくなり、この上に薄膜多層配線層を形成することができる。

【００２０】また、製造工程の最終段階で貫通めっきスルーホールが形成されないので、ベース基板上の薄膜多層配線層の配線密度を最大限にすることができる。さらに、ベース基板上の薄膜多層配線層とベース基板の内層導体層との接続，ベース基板の両面の接続，各導体層の接続等が、製造工程における最終段階の貫通めっきスルーホールの形成がなくても施すことができる。

【００２１】本発明に係る両面プリント配線板の製造方法によれば、貫通めっきスルーホールのある両面プリント配線板上に表面の平坦な金型を設置し、該両面プリント配線板と該金型との間に溶剤を含まない流動性有機系高分子前駆体を挟む工程と、該金型と該両面プリント配線板との間を排気する工程と、該金型を該両面プリント配線板方向へ移動させて該溶剤を含まない流動性有機系高分子前駆体を貫通めっきスルーホールおよび導体間隙に充填する工程と、該溶剤を含まない流動性有機系高分子前駆体に静水圧をかける工程と、該溶剤を含まない流動性有機系高分子前駆体を硬化する工程と、該有機系高分子で覆われた導体上面を露出させる工程とを含む工程としたので、貫通スルーホール内あるいは導体間隙にピンホールやクラックのない均一な物性の絶縁膜を形成することができる。また、次ぎの工程において形成される導体パッドを接続するために必要な該両面プリント配線板の表層導体の表面を露出させることができ、かつ、表面が平坦なベース基板を作ることができる。

【００２２】さらに、上記両面プリント配線板表層導体および貫通めっきスルーホール導体の所定位置に接続する導体パッドを形成する方法として、特殊な技術でなく、従来技術であるサブトラクティブ法あるいはアディティブ法を採用することができる。

【００２３】次ぎに、本発明に係る多層配線基板の製造方法によれば、感光性絶縁樹脂を成膜する工程，露光，現像により該感光性絶縁樹脂にビアホールを形成する工程と、露光された該感光性絶縁樹脂表面を粗化する工程と、導体を形成する工程と、熱硬化により該感光性絶縁樹脂を完全硬化する工程と、前記導体をエッチングによりパターンに形成させる工程を経る方法としたため、従来から問題となっていた前記導体と層間絶縁膜の接着強度を向上させることができ、信頼性の高い薄膜多層配線層を形成することができる。

【００２４】上記貫通めっきスルーホールあるいは導体間隙を埋めるために適用できる材料は、溶剤を含まない流動性有機系高分子前駆体であり、多官能エポキシ樹脂組成物，分子内に２個以上のマレイミド骨格を有する化合物の組成物，分子内に２個以上のシアン酸エステル骨格を有する化合物の組成物，分子内に２個以上のベンゾシクロブテン骨格を有する化合物の組成物の内の少なくとも１つ以上を含む組成物を用いることにより、耐熱性，機械特性，電気特性等に優れた絶縁膜を得ることができる。

【００２５】また、上記の感光性絶縁樹脂には、上記導体と層間絶縁膜との接着強度を向上させるために、光で硬化する成分と熱で硬化する成分とが必要であり、少なくとも、室温で固形の多官能不飽和化合物，エポキシ樹脂，アクリレートモノマー，光重合開始剤，アミン系の熱硬化剤を含む組成物，あるいは、少なくとも、不飽和基を付加反応させた２官能以上の多官能固形エポキシ樹脂，アクリレートモノマー，光重合開始剤，アミン系の熱硬化剤を含む組成物のいずれかにより、導体と層間絶縁膜との接着強度に優れ、かつ、良好な解像性も得られる。さらに、アミン系熱硬化剤に、ジシアンジアミドあるいはジアミノトリアジン化合物を用いたことで、導体のマイグレーションを抑えることができる。

【００２７】

【実施例】以下、本発明の各実施例を図１ないし図７を参照して説明する。

〔実施例　１〕図１は、本発明の一実施例に係る両面プリント配線板およびその製造方法を示す説明図、図５は、本発明の一実施例に係る両面プリント配線板の製造方法を示す説明図である。図１において、穴埋めされた層間接続スルーホールの導体と前記導体に接続する導体パッドが設けられた両面プリント配線板の製造方法の一例を説明する。

【００２８】両面の信号層を接続する貫通めっきスルーホール１０１と裏面の電源層との接続をとる２種類の貫通めっきスルーホール１０２、１０３とを有し、両面の銅がバターニングされた図１（ａ）に示すガラスポリイミド両面プリント配線板を用意する。前記プリント配線板としてはＢＴレジンのプリント配線板、例えば三菱瓦斯化学（株）製を用いても差し支えない。

【００２９】次ぎに、このプリント配線板の貫通めっきスルーホールと表層導体の間隙を有機系高分子の絶縁膜１０４で充填して図１（ｂ）に示す基板を作成するが、その間のプロセスが、図５に示される金型工程である。図５（ａ）に示されるように、前記図１（ａ）のプリント配線板の両面をフイルム状組成物１０５にて挟み、これを金型５０１の間に挿入する。

【００３０】前記フイルム状組成物１０５は、本実施例においては、溶剤を含まない流動性有機系高分子前駆体、例えば４官能ポキシ樹脂エピクロンＥＸＡ４７００（大日本インキ化学製造（株）製商品名）とフェノール樹脂バーカムＴＤ２１３１（大日本インキ化学製造（株）製商品名）６５ｐｈｒとを混練し溶融成形したものである。

【００３１】次いで、前記金型５０１を７０℃に加熱し

て上記フイルム状組成物１０５を溶融させ、さらに、前記金型５０１と前記プリント配線板との空間を１０ｔｏｒｒに排気して約７分間真空度を保持する。これにより、上記フイルム状組成物１０５が貫通めっきスルーホール１０１、１０２、１０３および銅配線間隙に充填され、図５（ｂ）に示される基板を構成した。

【００３２】そして、前記金型５０１と図５（ｂ）の前記プリント配線板の空間を大気圧に戻した後、圧縮圧力５ｋｇｆ／ｃｍ²にて上下方向から、横方向からの空気圧４．５ｋｇｆ／ｃｍ²にて横方向から加圧する。５分後に前記金型５０１を７０℃から２００℃まで勾配速度を７０℃／分にて昇温し、その状態にて３０分間保持した。

【００３３】そして、前記図５（ｂ）のプリント配線板を金型５０１から外して常圧下で２００℃，６０分加熱する。その結果、平坦で、ボイドやピンホールがなく、かつ、均一な物性を有する絶縁膜１０４が貫通めっきスルーホール１０１、１０２、１０３および表層配線導体間隙に形成される。この結果、図５（ｃ）に示されるプリント配線板を得た。

【００３４】図５（ｃ）のプリント配線板には表層導体上１０６に絶縁膜１０４の極薄膜が残存する。そこで、図５（ｃ）のプリント配線板を１００℃に加熱し、２０分間O_3の雰囲気下にて紫外線に曝すことにより、絶縁膜１０４をエッチバックし、表層導体を露出させた図５（ｄ）のプリント配線板、すなわち、図１（ｂ）のプリント配線板を得た。

【００３５】前記金型５０１におけるモールドの条件として、真空度は２０Ｔｏｒｒ以下、圧力は２０ｋｇｆ／ｃｍ²以下、上下方向の圧縮圧力は、横方向からの圧縮圧力よりも大きいか少なくとも等しいことが望ましく、その圧力差は１０ｋｇｆ／ｃｍ²以下であるとさらに良い結果が得られる。さらに、エッチバックの方法として酸素プラズマアッシングや研磨等を使用することもできる。

【００３６】このようにして形成した図１（ｂ）のプリント配線板両面には、銅の下地膜をスパッタにて０．５μｍの厚さに成膜し、次いで、通常の電気銅めっきにてさらに１５μｍの厚さに増し、前記プリント配線板両側の全面に銅１０７を成膜した図１（ｃ）に示されるプリント配線板を得た。前記銅１０７を成膜する方法としては、この他イオンプレーティングや熔射、化学めっき等の従来技術を用いることができる。

【００３７】次に、銅１０７の上に従来技術によりエッチングレジストを形成し、露光・現像・エッチング・剥離の工程により銅１０７をパターニングして、穴埋めされた層間接続スルーホールの導体と接続する導体パッド１０８やその他のパターンを有する両面プリント配線板、すなわち完成された図１（ｄ）の両面プリント配線板を得た。

【００３８】〔実施例　２〕次に、本発明の他の一実施例に係る両面プリント配線板を図１，２を参照して説明する。図２は本発明に他の一実施例に係る両面プリント配線板を示す説明図である。〔実施例　１〕と同様にして図１（ｂ）に示される両面プリント配線板まで形成する。

【００３９】次いで〔実施例　１〕では、いわゆるサブトラクティブ法により図１（ｄ）に示される両面プリント配線板を得たが、本実施例においては、いわゆるアディティブ法にて導体パッド２０１を形成した。

【００４０】すなわち、図１（ｂ）の両面プリント配線板の両面に所定の従来技術によりめっきレジストを形成し、露光・現像により所定の抜きパターンを得た後、化学銅めっきにて導体パッド２０１を形成してレジストを剥離する。このようにして、図２に示される穴埋めされた層間接続スルーホールの導体と前記導体に接続される導体パッドが設けられた両面プリント配線板を完成した。

【００４１】〔実施例　３〕次に、本発明のさらに他の一実施例に係る両面プリント配線板の製造方法を図１，３を参照して説明する。図３は、本発明にさらに他の一実施例に係る両面プリント配線板の製造方法を示す説明図である。〔実施例　１〕と同様にして図１（ｂ）に示される両面プリント配線板まで形成する。

【００４２】図３に示される両面の信号層を接続する貫通めっきスルーホール３０１と裏面の電源層との接続をとる２種類の貫通めっきスルーホール３０２、３０３とを有し、両面の銅がパターニングされていない図３（ａ）に示されるガラスポリイミド両面プリント配線板を用意する。

【００４３】次ぎに、〔実施例　１〕と同様にして、この両面プリント配線板の貫通めっきスルーホールを有機系高分子の絶縁膜３０４で充填して図３（ｂ）に示される基板とし、図３（ｂ）の基板の両面に従来の方法によりめっきレジストを形成し、露光・現像により所定の抜きパターンを得た後、化学銅めっきにて導体パッド３０５を形成し、レジストを剥離して図３（ｃ）に示される両面プリント配線板とした。

【００４４】そして、この上に所定の方法によりエッチングレジストを形成し、露光・現像・エッチング・剥離の工程により銅３０６をパターニングして、穴埋めされた層間接続スルーホールの導体と接続する導体パッド３０６やその他のパターンを有する図３（ｄ）に示される両面プリント配線板が得られる。

【００４５】〔実施例　４〕次に、図３，４を参照して本発明のさらに他の一実施例を説明する。図４は、本発明にさらに他の一実施例に係る両面プリント配線板を示す説明図である。〔実施例　３〕と同様にして図３（ｂ）に示される両面プリント配線板まで形成し、次いで図３（ｂ）の両面プリント配線板の両面全面に〔実施

例　１〕と同様にして銅を１５μｍの厚さに成膜した。

【００４６】そして、この上に所定の方法によりエッチングレジストを形成し、露光・現像・エッチング・剥離の工程により銅をパターニングする。この結果、図４に示される穴埋めされた層間接続スルーホールの導体と接続する導体パッド４０１やその他のパターンを有する両面プリント配線板を得た。

【００４７】〔実施例　５〕次に、図１，６，７を参照して本発明のさらに他の一実施例に係る多層配線基板の製造方法を説明する。図６は、本発明のさらに他の一実施例に係る多層配線基板の製造方法の説明図、図７は、＊本発明のさらに他の一実施例に係る多層配線基板の説明図である。

【００４８】〔実施例　１〕の方法で形成した図１（ｄ）に示された穴埋めされた層間接続スルーホールの導体と接続する導体パッドが設けられた両面プリント配線板を使用し、その上にビルドアップ法にて薄膜多層配線層が形成された多層配線基板およびその製造方法とを説明する。

【００４９】本実施例においては、露光・現像工程の感光性絶縁樹脂として下記（イ）～（ヘ）よりなる樹脂組成物を調整し使用した。

（イ）ジアリルフタレート樹脂	１００ｇ
（ロ）エピコート８２８	３０ｇ
（ハ）ペンタエリスリトールトリアクリレート	２０ｇ
（ニ）ベンゾインイソプロピルエーテル	４ｇ
（ホ）ジシアンジアミド	４ｇ
（ヘ）２，４－ジアミノ－６－〔２’－メチルイミダゾリル－（１’）〕－エチル－ｓ－トリアジン	１ｇ
（ト）その他（塗布特性向上のための添加剤）	適量

【００５０】まず、上記（イ）～（ハ）と適量の溶剤（エチルセロソルブ）とを混合した樹脂組成物を形成し、８０℃で３０分間加熱撹拌した。次に、前記樹脂組成物を常温にした後、他の成分（ニ）～（ト）を混合し、例えば三本ロールにて混練し、感光性絶縁樹脂を得た。上記感光性絶縁樹脂６０１を図１（ｄ）に示される両面プリント配線板の両面にスプレーコータで厚さ５０μｍ塗布し、８０℃で３０分間の予備乾燥を施し、図６※（ａ）に示される基板を得た。

【００５１】次いで、４００Ｗ高圧水銀ランプを用い２分間、紫外光でパターン露光し、現像してビアホール６０２を形成し、さらに、全面露光をして図６（ｂ）に示される基板を得た。その後、前記樹脂膜と後工程にて形成されるめっき皮膜との接着強度を確保するために樹脂表面の粗化を行った。使用した粗化液および粗化条件は、次の通りである。

過マンガン酸カリウム	０．１～０．５ｍｏｌ／ｌ
水酸化ナトリウム	０．２～０．４ｍｏｌ／ｌ
液温	５０～９０℃

【００５２】上記図６（ｂ）に示される基板を３～１０分間浸漬し粗化を行い、５０ｖｏｌ％塩酸に３分浸漬して中和させ、後に水洗・乾燥して粗化層を形成した。次に、粗化層を活性化するため触媒液に浸漬し、下地導電膜を無電解銅めっきにより０．２μｍの厚さに形成した★後、樹脂層を完全硬化するため１５０℃で３０分間加熱硬化を行い、最後に、厚付け電気銅めっき６０３を１５μｍを施して図６（ｃ）に示される基板とした。

【００５３】触媒処理液その他および処理条件を下記に示す。

（触媒処理液）シップレー社製

①キャタプリップ４０４	（２７０ｇ／ｌ）	４５℃、３分
②キャタプリップ４０４	（２７０ｇ／ｌ）	４５℃、５分
キャタポジット４４	（３０ｍｌ／ｌ）	
③アクセレータ		室温、３分

【００５４】

（導電膜）　シップレー社製

カッパーミックス　３２８Ａ	（１２５ｍｌ／ｌ）	室温、１分
カッパーミックス　３２８Ｌ	（１２５ｍｌ／ｌ）	
カッパーミックス　３２８Ｃ	（２５ｍｌ／ｌ）	

【００５５】

（銅めっき前処理）

ニュートラクリーン	（５０ｖｏｌ％）	室温、３分
硫酸洗浄	（１０ｖｏｌ％）	室温、１分

【００５６】（厚付け電気銅めっき）

$CuSO_4 \cdot 5H_2O$	（７５ｍｌ／ｌ）

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H_2SO_4　（９８ｍｌ／ｌ）
ＨＣｌ　（０．１５ｍｌ／ｌ）
Ｃｕ－ボードＨＡメーキャップ（１０ｍｌ／ｌ）
（株）荏原ユージライト製
液温　室温
電流密度　２Ａ／ｄｍ²

【００５７】次ぎに、通常の方法により基板にエッチングレジストを形成し、露光・現像・エッチング・剥離の工程により銅６０３をパターニングし、さらに、不要な回路間の触媒を除去して第１層目の導体パターン層６０４を形成する。その結果、図６（ｄ）に示される基板を得た。

【００５８】触媒の除去は５ｗｔ％ＮａＯＨの強アルカリ水溶液に１０分間浸漬して実施し、第２層、第３層の導体パターン層の形成に関しても上記と同様に実施した。最後に、ソルダ- レジストを表面に形成して図７に示される多層配線基板を得た。

＊（無電解ニッケルめっき液）
ブルーシューマー（Ｎｉ－Ｐ）
液温
めっき時間

下地導電膜は、銅よりもニッケルの方が樹脂との接着強度は大きい。

【００６２】〔実施例　７〕次に、図１，７を参照して本発明のさらに他の一実施例に係る多層配線基板の製造方法を説明する。図１（ｄ）に示される両面プリント配線板の表面導体の保護および下地導電膜に〔実施例

※クロム硫酸粗化液および条件
無水クロム酸　２．０ｍｏｌ／ｌ～飽和濃度
硫酸　３．６～６ｍｏｌ／ｌ
液温　５０～８０℃
時間　３～１０分
アルカリ中和処理　５～１０分

【００６４】〔実施例　８〕次に、図２，７を参照して本発明のさらに他の一実施例に係る多層配線基板の製造方法を説明する。〔実施例　２〕の方法で形成した図２に示される穴埋めされた層間接続スルーホールの導体と前記導体に接続される導体パッドが設けられた両面プリント配線板を用い、この上に〔実施例　６〕と同様のビルドアップ法により図７に示される多層配線基板と同様の層を構成した多層配線基板を製造した。

【００６５】〔実施例　９〕次に、図３，７を参照して本発明のさらに他の一実施例に係る多層配線基板の製造方法を説明する。〔実施例　３〕の方法で形成した図３（ｄ）に示される穴埋めされた層間接続スルーホールの導体と接続する導体パッドが設けられた両面プリント配線板を用い、この上に〔実施例　６〕と同様のビルドアップ法にて図７に示される多層配線基板と同様の層構成の多層配線基板を製造した。

【００６６】〔実施例　１０〕次に、図４，７を参照し

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＊【００５９】図７に示される多層配線基板の層構成は、７０１と７０８とが、キャップとグランド層を兼ね、７０２，７０３と７０６，７０７とが信号層、７０４と７０５とが２種類の電源層である。ベース基板の表裏の信号層間および裏面の電源層とは、穴埋めされた貫通めっきスルーホールと、前記スルーホールと接続される導体パッド７０９とにより接続される。

【００６０】〔実施例　６〕次に、図７を参照して本発明のさらに他の一実施例に係る多層配線基板の製造方法を説明する。図７は、本発明のさらに他の一実施例に係る多層配線基板の説明図である。〔実施例　５〕においては、前記の如く下地導電膜を無電解銅めっきにより０．２μｍの厚さに形成したが、〔実施例　６〕においては、下地導電膜として下記の無電解ニッケルめっきを施し、〔実施例　５〕と同様の方法にて図７に示される多層配線基板を得た。

【００６１】

原液使用　カニゼン社製
８０℃
５分

※６〕と同様の無電解ニッケルめっきを用い、粗化液および粗化条件として下記のクロム硫酸粗化液および条件を用い、他の条件は〔実施例　５〕と同様にして、図７に示される多層配線基板を得た。

【００６３】

て本発明のさらに他の一実施例に係る多層配線基板の製造方法を説明する。〔実施例　４〕の方法で形成した図４に示される穴埋めされた層間接続スルーホールの導体と前記導体に接続される導体パッドが設けられた両面プリント配線板を用い、この上に〔実施例　６〕と同様のビルドアップ法にて図７の多層配線基板と同様の層構成の多層配線基板を製造した。

【００６７】上記各実施例の多層配線基板と貫通スルーホールやインタースティシャルビアホールで層間接続をとる通常の多層配線基板とを比較すると、格子ピッチを１．２７ｍｍとし、格子間に２本の配線を形成できるとして計算した時の配線密度（格子の数、配線長を考慮）を１とすると、本実施例の多層配線基板のビルドアップ法により形成した薄膜多層配線層は、格子ピッチ０．６３５ｍｍに少なくとも２本の配線を形成できるので相対配線密度は約２倍とすることができる。

【００６８】これは面積を同じとすると信号層数を１／

２に、逆に、信号層数を同じとすると面積を１／２にすることができる計算になり、高密度化とコスト低減の効果が大きい。これに対して、製造の最終段階で貫通めっきスルーホールを形成すると、その面積分の配線をロスすることになる。

【００６９】上記各実施例は、両面プリント配線板の両表層導体を２種類の電源層とし、この両面にＸＹ信号層２層と、グランドとキャップ層とをかねた１層とを形成して成る多層配線基板およびその製造方法について説明したが、本発明は、層構成に限定されるものでなく、上記両面プリント配線板の内層にＸＹ信号層２層を入れた４層板を用いても差し支えない。

【００７０】また、溶剤を含まない流動性有機系高分子前駆体の前記フィルム組成物についても、上記実施例では、４官能ポキシ樹脂エピクロンＥＸＡ４７００（大日本インキ化学製造（株）製商品名）とフェノ　ル樹脂バーカムＴＤ２１３１（大日本インキ化学製造（株）製商品名）６５ｐｈｒとを混練し溶融成形したものを用いたが、ビスマレイミド／シアン酸エステル系材料であるＢＴ－３３０９Ｔ（三菱瓦斯化学（株）製商品名）やベンゾシクロブテン系材料である１８０℃で５時間加熱してオリゴマー化したシスビスベンゾシクロブテニルエテンを用いても差し支えない。その際の硬化温度はそれぞれ２２０℃，２５０℃とすることが好ましい。

【００７１】

【発明の効果】以上詳細に説明したように、本発明によれば、耐熱性、機械特性、電気特性等の特性に優れ、低コスト、かつ、信頼性が高い、貫通めっきスルーホールの穴の影響がない、高密度配線機能を有する多層配線基板，ビルドアップ法が形成しうる本来の高密度配線機能を最大限に活用するその製造方法および前記多層配線基板に用いられる両面プリント配線板の製造方法を提供することができる。

【図面の簡単な説明】

【図１】本発明の一実施例に係る両面プリント配線板およびその製造方法を示す説明図である。

【図２】本発明に他の一実施例に係る両面プリント配線板を示す説明図である。

【図３】本発明にさらに他の一実施例に係る両面プリント配線板の製造方法を示す説明図である。

【図４】本発明にさらに他の一実施例に係る両面プリント配線板を示す説明図である。

【図５】本発明の一実施例に係る両面プリント配線板の製造方法を示す説明図である。

【図６】本発明のさらに他の一実施例に係る多層配線基板の製造方法の説明図である。

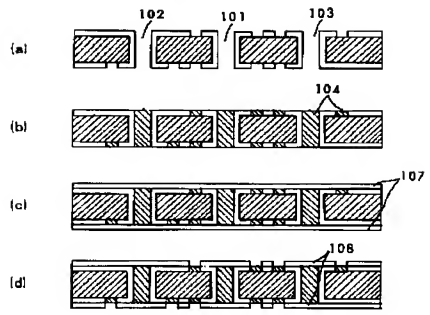
【図７】本発明のさらに他の一実施例に係る多層配線基板の説明図である。

【符号の説明】

１０１　両面の信号層を接続する貫通めっきスルーホール
１０２　裏面の電源層との接続をとる貫通めっきスルーホール
１０３　裏面の電源層との接続をとる貫通めっきスルーホール
１０４　有機系高分子の絶縁膜
１０５　溶剤を含まない流動性有機系高分子前駆体のフイルム状組成物
１０６　表層導体部
１０７　銅
１０８　穴埋めされた層間接続スルーホールの導体と接続する導体パッド
２０１　穴埋めされた層間接続スルーホールの導体と接続する導体パッド
３０１　両面の信号層を接続する貫通めっきスルーホール
３０２　裏面の電源層との接続をとる貫通めっきスルーホール
３０３　裏面の電源層との接続をとる貫通めっきスルーホール
３０４　有機系高分子絶縁膜
３０５　導体パッド
３０６　銅
４０１　導体パッド
５０１　金型
６０１　感光性絶縁樹脂
６０２　ビアホール
６０３　銅
６０４　導体パターン層
７０１　キャップ層をかねるグランド層
７０２　信号層
７０３　信号層
７０４　電源層
７０５　電源層
７０６　信号層
７０７　信号層
７０８　キャップ層をかねるグランド層
７０９　導体パッド

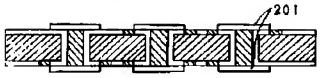
【図１】

図 1



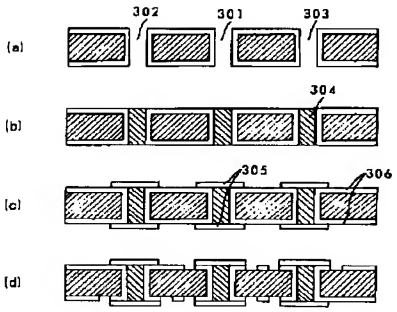
【図２】

図 2



【図３】

図 3

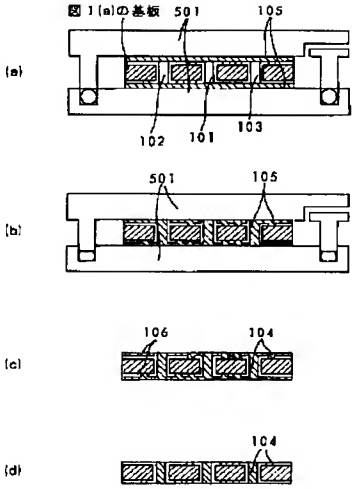


【図４】

図 4

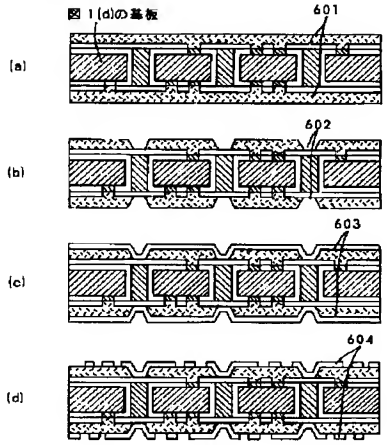
【図５】

図 5



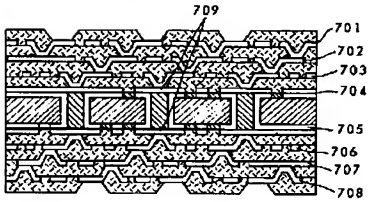
【図６】

図 6



【図７】

図 7



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